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Surgical Instrument

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Surgical Instrument

The invention relates to a surgical instrument, especially a biopsy forceps for insertion into the human body and there in particular into the digestive tract, having a punch [OR: mandrel] that is generally comprised of a dagger-like blade, a punch support with two fork jaws and an expansion jaw that encloses the punch in lock position.

Instruments of this type have been used for years in surgery. The dagger-like punch is located between the two fork jaws, with the surface area of the blade being arranged parallel to the fork jaws and/or perpendicular to an axis of rotation for the expansion jaw. Said perpendicular punch is then penetrated by a bolt that connects the punch and the fork jaws. Downstream of the bolt, a pin or component to be bent, which projects to one side and is located in a side wall when in use, is provided

to fix the punch into position to keep it from rotating around the bolt.

Said arrangement and in particularly the pin, which is arranged relatively close to the rotational axis of the expansion jaw, effects that the profile strips, which connect expansion jaw components to their axis of rotation, must have special recesses and/or kinks so that when in motion, they do not suffer any interfere from the components formed integrally with the punch, in particular the component to be bent, especially because the space between the fork jaws is only a few tenths of a millimeter in instruments of this type. Providing said recesses, routs or kinks is not only a tedious work process but also results in a weakening of the profile strip.

The same also applies if the bolt that penetrates the punch simultaneously also forms the fulcrum pin for the two forceps components of the expansion jaw. Furthermore, this makes assembling the punch and the two forceps components with the component to be bent projecting toward the rear, much more difficult. However, because said component to be bent is by nature developed rather weakly, but is subjected to severe gravitational force during use, there is always the risk that it will break off and the punch will become rotational, which would prevent its use.

The inventor wanted to attain the goal of developing an instrument of the type mentioned above which does not have these disadvantages, can be assembled easily, and is robust in use.

The object of the invention was attained in that the punch is firmly connected to the two fork jaws of the punch support through its punch foot [OR: base]. This makes an additional forming to the foot of the punch obsolete and eliminates an interference factor for the movement of the components of the expansion jaw. Furthermore, expansion jaw components and in particular their axis is clearly separated from the punch, which simplifies the assembly.

Preferably, the firm connection between the foot of the punch and the fork jaws is achieved by welding, with laser beam welding being preferred. This generates a connection between the foot of the punch and the fork jaws on a minimal surface, which is so strong that if the punch should break off as a result of force, said break would occur at another location than the weld seam. Furthermore, there is no risk of an unnoticed loosening of the blade; i.e., it either breaks off or it does not.

To avoid having to connect the punch foot and the fork jaws directly, lateral tabs should be formed on said punch foot, which are welded into the grooves formed into the face area of the fork jaws. This can also compensate for imprecision in the fit and enforce the entire support of the punch.

In practice, the surface area of the punch will be arranged at a specific angle relative to the axis of the expansion jaw, with a position running approximately on the plane of the axis of rotation being preferred.

Said punch form with the tabs simplifies the production because the lateral forms can be punched out

simultaneously, for example when the punch is punched out. Heretofore, for one, a through-boring of the punch body was required for this, and secondly, an additional bending of the component to be bent, after the punch had been punched out.

The merit of separating the expansion jaw components and the punch is in particular that potential forms at the punch do not have to be taken into consideration in the production of expansion jaw components and here in particular in the production of shearing profile strips. The profile strips have a smooth and straight surface, i.e., there has been no weakening.

If the punch is damaged, it is not necessary to remove the entire expansion jaw as well. Rather, it is sufficient if the punch is cut out of the fork jaws at its welding seams.

Overall, the individual components of the instrument in its embodiment in accordance with the invention are easier to produce and the instrument is easier to assemble. Furthermore, it also appears to be safer when in use. The welding causes an additional thermal treatment of the steel of which the punch is made, for example. This leads to a hardening and thus to an increased stability not only of the punch but of the entire instrument.

When tissue components are cut off by means of the forceps, the tissue samples are not pressed on the blade of the punch in the expansion jaw and cut even further, as is the case with the known biopsy forceps.

Other advantages, characteristics and details of the invention are shown in the following description of a preferred embodiment as well as the illustration, which shows:

Fig. 1 a lateral view of a front segment of a surgical instrument in accordance with the invention;

Fig. 2 a partially cut top view of a front segment in accordance with Fig. 1.

In accordance with Fig. 1, a surgical instrument of the present type, which in particular is intended as a biopsy forceps to be introduced into parts of the digestive tract to remove tissue samples from parts of the digestive tract, is comprised of a bendable shaft 1 (shown only partly), a punch support 2, the actual punch 3 and an expansion jaw 4.

The punch support 2 is inserted into and immobilized in the bendable shaft 1 which, for example, may be comprised of coil spring-like coiled metal wire. To move the expansion jaw 4, a wire (not shown) runs through the shaft 1 and partially through the punch support 2 and is connected to the expansion jaw 4, as described below.

The punch support 2 is comprised of two fork jaws 5 that project from a shank 15 which at one end engages in the shaft 1. Another point of connection is a pivot pin for the expansion jaw 4. At the end, the punch 3 connects the two

fork jaws 5 at the tip 7. The present punch is comprised of a dagger-like blade 8 and centers the instrument when in use position. The punch foot 9 has lateral tabs 10 that are welded to the fork jaws 5. This is preferably done with the known laser beam welding process, which results in an extremely firm connection between two metals on a very small welding surface area.

The expansion jaw 4 is comprised of two equal spoon-like forceps 11. Each forceps 11 has a gripping spoon 12 and a profile strip 13, which is formed parallel onto said gripping spoon next to a spoon axis A. Said profile strip 13 is located at the pivot pin 6, with said pivot pin forming a axis of rotation B for the two gripping spoons 12. Fig. 1 furthermore shows borings 14 at the profile strips, which connect said profile strips to the aforementioned wire with support strips (not shown) in a toggle joint fashion. If the wire is advanced in the direction of the punch 3, the distance between the end of the wire and the pivot pin 6 decreases. Therefore, the supporting strips and with them the profile strips 13 must travel outward and the gripping spoons 12 open.

As a result of arranging the profile strips parallel to the spoon axis A, both profile strips 13 can move past one another without any interference. They do not require any additional recesses or kinks.

When the instrument is inserted into the human body, for example into the intestine, the wire is retracted and thus the expansion jaw 4 is closed. Thus, the punch 3 is also obscured, which prevents any unintended injuries to the

intestine, etc. or any damage to the punch. The movement of the instrument is observed externally (for example on the X-ray screen or with cold light). As soon as the expansion jaw 4 arrives near the location where the tissue samples are to be removed, the wire is advanced, and the expansion jaw 4 opens and releases the punch 3. The location where the tissue samples are to be removed is centered with said punch 3. The expansion jaw 4 is closed by pulling the wire, it cuts off the tissue sample and holds the piece of tissue.

Then the entire instrument can be removed again from the human body and a biopsy of the tissue sample can be performed.

Claims

1. Surgical instrument, in particular biopsy forceps for introduction into the human body and here in particular into the digestive tract, having a punch that is generally comprised of a dagger-like blade, a punch support with two fork jaws and an expansion jaw that encloses the punch in lock position,

   characterized in that

   the punch (3) is firmly connected to the two fork jaws (5) of the punch support (2) through its punch foot (9).

2. Instrument in accordance with Claim 1, characterized in that the punch foot (9) is welded to the two fork jaws (5).

3. Instrument in accordance with Claim 2, characterized in that the welding is performed by means of a laser beam.

4. Instrument in accordance with one of the claims 1 to 3, characterized in that lateral tabs (10) are formed on the punch foot (9) in direction of the fork jaws (5) and that said tabs rest in grooves formed on the face of the fork jaws (5).

5. Instrument in accordance with at least one of the Claims 1 to 4, characterized in that the punch surface

is arranged on the plane of an axis of rotation (B) for forceps components (11) of the expansion jaw (4).

6. Instrument in accordance with at least one of the claims 1 to 5, characterized in that the expansion jaw (4) is comprised of two forceps components (11) and each of said forceps components has a gripping spoon (12) and a smooth profile strip (13), which are supported on a pivot pin (6) that forms an axis of rotation (B).

7. Instrument in accordance with Claim 6, characterized in that the profile strips (13) are arranged on both sides parallel to an axis (A) of the gripping spoons (12).